furnish a complete solution to it, we will publish it in the next issue of the MONTHLY. ED.]

PROBLEMS.

9. Proposed by H. C. WHITAKER, B. S., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

Four numbers taken at random are multiplied together. What is the probability that the last digit will be 0?

10. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College. New Windsor, Maryland.

Upon a surface one foot square, a coin one inch in diameter is thrown; what is the chance the coin *touches* or *intersects* both diagonals?

11. Proposed by ARTEMAS MARTIN, A. M., Ph. D., LL. D., U. S. Coast and Geodetic Survey Office, Washington, D. C.

Find the average area of a triangle formed by joining a corner of cube with any two points within the cube.

12. Proposed by Professor G. B M. ZERR, A. M., Principal of High School, Staunton, Virginia.

A large plane area is ruled by two sets of parallel eqidistant straight lines, the one set perpendicular to the other. The distance between any two lines of the first set is a; the distance between any two lines of the second set is b. If a regular polygon of $2n$ sides be thrown at random upon this area, find the chance that it will fall across a line, the diameter of the circum-circle of the polygon being less than a or b.

Solutions to these problems should be received on or before August 1st.

MISCELLANEOUS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

7. Proposed by Rev. A. L. GRIDLEY, Pastor of Congregational Church, Kidder, Missouri.

Making no allowance for the curvature of the earth and supposing the sun to rise in the east and set in the west, what would be the course of a man who should walk constantly toward the sun from morning until night? How far and in what direction from the staring point would he be, walking three miles per hour, at the end of three days?

Solution by H. C. WHITAKER, B. S., C. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

Let the azimuth of the sun and of the direction in which the man is walking be counted from the south toward the west and let it be denoted by ϕ. Take as the origin the position of the man at noon and let the time (t) be counted

at noon. Let r denote the rate of the man, s the distance he walks in time t, l his latitude *assumed to be constant*, h the hour angle after noon. Then from spherical trigonometry, $\cot\phi=\sin l\cot h$ (1). But $h=\frac{\pi t}{12}=\frac{\pi s}{12r}$, hence $\cot\phi=\sin l\cot\frac{\pi s}{12r}$ (2) which is the intrinsic equation of the path of the man, latitude assumed constant.

From this, $ds=\frac{12r\sin l}{\pi}\,\frac{d\phi}{1-\cos^2 l\sin^2\phi}$

$$x=\int\sin\phi ds=\frac{12r\sin l}{\pi}\int\frac{\sin\phi d\phi}{1-\cos^2 l\sin^2\phi}=\frac{12r}{\pi\cos l}\left[\tan^{-1}\frac{\sin l\tan(\frac{\pi}{4}+\frac{\phi}{2})}{1+\cos l}\right.$$

$$\left.-\tan^{-1}\frac{\sin l\tan(\frac{\pi}{4}+\frac{\phi}{2})}{1+\cos l}-\tan^{-1}\frac{\sin l}{1-\cos l}+\tan^{-1}\frac{\sin l}{1+\cos l}\right]\quad(3).\qquad y=\int\cos\phi d\theta$$

$$=\frac{12r\sin l}{\pi}\int\frac{\cos\phi d\phi}{1-\cos^2 l\sin^2\phi}=\frac{6r\sin l}{\pi}\log_e\left[\frac{1+\cos l\sin\phi}{1-\cos l\sin\phi}\right]\quad(4).$$

Since only y is desired, in (2) we let $s=6r$, then $\phi=\frac{\pi}{2}$, whence in (4) $y=\frac{6r\sin l}{\pi}\log_e\cot^2\frac{1}{2}l=\frac{12r\sin l}{\pi}\log_e\cot\frac{1}{2}l$ which is the distance traveled south in one-half day. In 3 days at 3 miles per hour $y=\frac{216\sin l}{\pi}\log_e\cot\frac{1}{2}l$.

QUERIES AND INFORMATION.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

Answers to Queries in the American Mathematical Monthly for March 1894. (Vol. I. No. 3. page 102).

Continued from the May number.

IV. In the spaces called after Riemann, called by Klein *elliptic*, the whole straight line is finite.

Two such straights, having crossed, recur to the point of crossing without going through any point at infinity.

V. In Euclid's constructions, only pieces of straights occur, each piece having two given end points. Such pieces are *sects*, always finite. But as soon as, with von Staudt, we admit a point at infinity, then we have straights with two ends, yet infinite; for the whole straight is infinite, and so its half is infinite.

One of the two costraight rays from a given point to a point at infinity is always infinite.

VI. In Lobatschewsky's geometry, all coplanar copunctal straights are divided, with reference to a given coplanar straight, into *cutting* and *not-cutting*, by two boundary lines, which do not cut the given line for any finite construction, but each of which has a point at infinity in common with the given line.